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*Building today for
a better tomorrow*

Building a Strong
Economy Through
Knowledge and
Innovation

February 1999

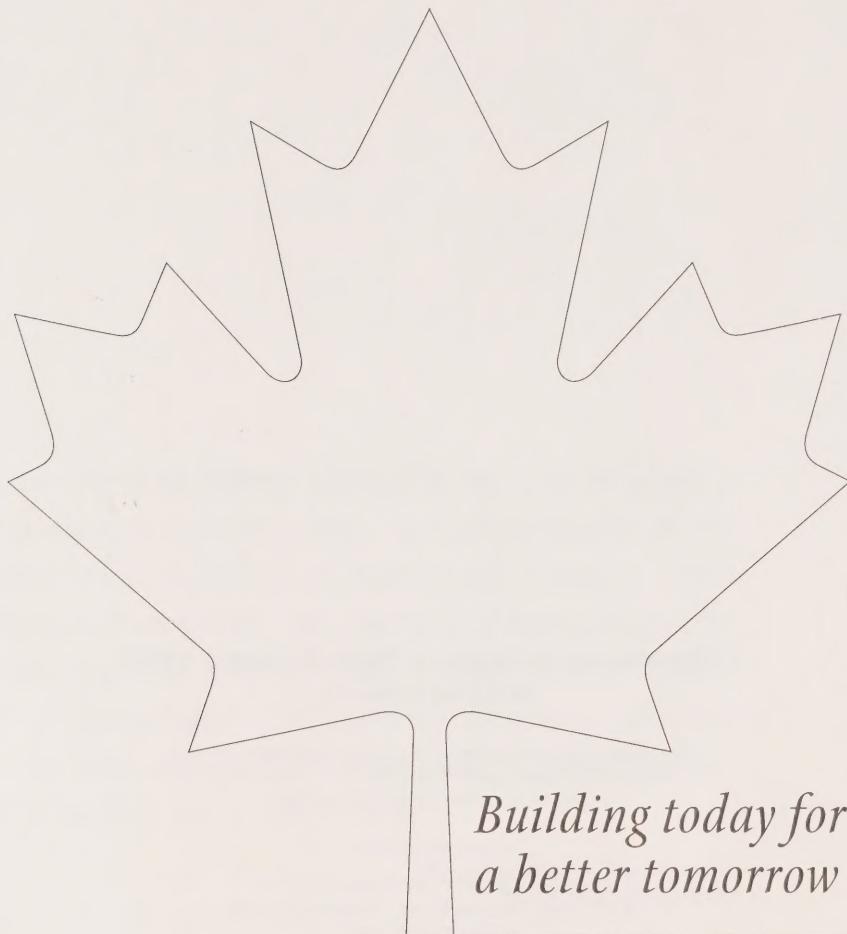
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a better tomorrow*

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Department of Finance
Canada

Ministère des Finances
Canada

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“Over the past several years, we have put in place a new framework for innovation – a strategy that we have implemented step by step in each of our budgets. That strategy has three parts – the creation of knowledge, the dissemination and sharing of knowledge and the application of knowledge – its commercialization, getting ideas out into the market. This budget takes further action in each of those three areas.”

Finance Minister Paul Martin
1999 budget speech

Highlights of the 1999 Budget

Creating Knowledge

- ***Canada Foundation for Innovation***

\$200 million to help meet the demand for research infrastructure in the areas of health, the environment, science and engineering.

- ***Natural Sciences and Engineering Research Council (NSERC)***

\$75 million over three years to build on Canada's support for basic research and advanced studies funded by NSERC.

- ***Social Sciences and Humanities Research Council***

\$15 million in additional funding over three years for new research in the social sciences and humanities.

- ***National Research Council***

\$16 million in 1998-99 to invest in leading-edge equipment, plus \$15 million over three years in support of national and regional research objectives.

- ***Biotechnology Research and Development***

\$55 million over three years for biotechnology research and development by federal science-based departments and agencies.

Disseminating Knowledge

- ***Smart Communities***

\$60 million over three years to establish demonstration projects to promote the effective use of information technology in such areas as education and lifelong learning, health, government services, business and industry, employment, library and information services, transportation and culture.

- ***GeoConnections***

\$60 million over five years to make available – through the information highway – comprehensive and integrated data about Canada's geography, environment, people and resources.

Highlights (*continued*)

Commercializing Knowledge

- *Networks of Centres of Excellence*
\$90 million over three years to support partnerships among world-class researchers and the private sector across Canada.
- *Technology Partnerships Canada (TPC)*
\$150 million over three years to help keep Canada at the forefront of technological innovation. TPC makes strategic investments with companies to commercialize innovative products and processes.
- *Business Development Bank of Canada (BDC)*
A \$50-million equity injection to help the BDC expand financing for small- and medium-sized knowledge-based and export-oriented businesses.
- *Canadian Space Agency (CSA)*
\$430 million over three years, and ongoing stable funding of \$300 million annually thereafter, for the CSA to make strategic investments in space projects, science and technology.

Supporting Employment

- *Youth Employment Strategy*
\$465 million over three years – a 50-per-cent increase over the preceding three-year period.
 - *Canada Jobs Fund*
\$110 million per year to create sustainable jobs in high-unemployment regions of Canada.
-

The 1999 budget will invest more than \$1.8 billion over the remainder of this fiscal year and the next three years in advanced research, the information highway, innovation, and in support of employment.

Introduction

Powerful forces are reshaping the global economy. Rapid technological innovation is transforming the skills and knowledge required for competing domestically and abroad. At the same time, the world is becoming smaller as goods, services and workers move much more swiftly and freely across borders.

In the modern economy, individuals and businesses must move quickly to seize the opportunities created by globalization and advances in technology. Competitiveness is becoming more dependent on the ability to create new products and put innovative technologies to work. Developing a highly skilled workforce is therefore crucial.

The federal government has a key role to play in this process by promoting access to knowledge and skills, and by expanding the capacity of businesses to innovate.

This booklet describes measures in the 1999 budget that build on the 1998 budget's Canadian Opportunities Strategy and on other knowledge and innovation investments introduced in previous budgets. The measures are designed to assist in the creation, dissemination and commercialization of knowledge. They also provide direct support to employment, particularly for youth.

The Challenge

A key goal of the federal government is to build a strong economy – one that generates well-paying jobs and a higher standard of living for all Canadians.

Economists measure our standard of living using a statistic called real gross domestic product (GDP) per capita – i.e., the amount of goods and services produced in a year for each person in Canada. In recent years, there has been an improvement in the growth rate of Canada's real GDP per capita. To continue this improvement over the longer term, we must increase our potential for economic growth.

Employment growth and productivity growth are the two factors that determine the potential growth rate of our economy. *Employment growth* means getting more people working, while *productivity growth* is about increasing the amount that each employed person produces.

Employment growth was an important source of the increase in living standards in the 1970s and 1980s, when the baby boom generation entered their working years, and women entered the workforce in unprecedented numbers. However, Canadians cannot count solely on employment growth to improve living standards over the long term. Indeed, as baby boomers retire, Canada's standard of living will become even more dependent on productivity growth.

This is the productivity challenge. Growth in productivity is the key to a better standard of living for all Canadians in the 21st century.

Growth in productivity is the key to a better standard of living for all Canadians

Acting on several fronts to improve Canada's standard of living

Building the Framework for a Better Standard of Living

Over the past five years, the federal government has taken meaningful steps towards improving the standard of living for all Canadians through strong productivity growth. There is no single policy measure that will guarantee stronger productivity performance in the future. This means that the federal government must continue to act on several fronts.

■ *Restoring fiscal balance*

By restoring balance to the country's fiscal situation, the government has reduced the burden of debt relative to the size of Canada's economy. The benefits of fiscal balance are low interest rates, low inflation and more confidence among consumers and businesses. This has created a healthy environment for business investment, which is a key ingredient for raising productivity growth and supporting job creation over the longer term.

■ *Strategic investments and tax relief*

A lower debt burden gives the government more scope to make economic and social investments and provide tax relief. Since tax relief increases the reward from working, saving and investing, it must be a prominent part of any long-term strategy to advance productivity growth and job creation.

The Role of Knowledge and Innovation in the Productivity Framework

There is more to productivity growth than sound fiscal management, tax relief and overall business confidence. In today's economy, investment in knowledge and innovation is crucial.

To be able to compete successfully in the global marketplace, firms must continually innovate. This is essential not only for high-tech companies, but in all sectors.

The creation of new technologies and the development of new products and production processes require people who have leading-edge research skills and people who know how to put new technology to work. They also require a modern, sophisticated infrastructure.

To harness the opportunities of the new economy for Canadians, the government has been making strategic investments in knowledge and innovation over the past five years. Here are some examples:

- Through Technology Partnerships Canada and the Industrial Research Assistance Program, the government is working with companies throughout Canada on specific research and development opportunities. Through these two programs, the government commits about \$380 million annually in support of jobs and growth in the knowledge-based economy.
- Claims under the federal scientific research and experimental development (SR&ED) tax credit now total \$1.3 billion annually. The SR&ED tax credit is widely recognized as one of the most generous incentives for research and development in the world.
- The federal government estimates that it will fund about \$3.3 billion in research and development (R&D) in 1998-99, or 22 per cent of all R&D in Canada. The government is committed to increasing the effectiveness and diffusion of federal research, thereby maximizing economic and social benefits for all Canadians.

The government has also actively encouraged the use of information and communications technologies. It has done this partly by maintaining a policy and regulatory framework that ensures competition in the local, long-distance and cellular telephone markets, as well as in the markets for cable- and satellite-based television and other advanced telecommunications services. Canadian consumers may now choose from an increasing array of more affordable and powerful communications equipment and services.

Five years of
strategic federal
investments
in knowledge
and innovation

These developments are significant in light of the role of telecommunications as an enabling technology that increases the capacity for innovation throughout the economy.

Canadian Opportunities Strategy

Another key federal initiative is the Canadian Opportunities Strategy, which was introduced in the 1998 budget. The Canadian Opportunities Strategy is a comprehensive plan to expand access to the knowledge, skills and learning that Canadians need to get better jobs and achieve a higher standard of living in the 21st century. It targets strategic investments in seven areas:

- providing financial assistance for students;
- providing support for advanced research;
- helping individuals manage their student debt;
- encouraging families to save for education;
- helping Canadians upgrade their skills;
- supporting youth employment; and
- connecting Canadians to information and knowledge.

Through this strategy, the government is investing over \$1.2 billion next year to support Canadians in the acquisition of knowledge and skills. In addition, starting in 2000, the Canada Millennium Scholarship Foundation will provide over \$300 million annually in awards to 100,000 students from low- and middle-income families. The Foundation was established in June 1998 with a \$2.5-billion contribution from the federal government.

Another feature of the Canadian Opportunities Strategy is the Canada Education Savings Grant (CESG), which provides a 20-percent bonus on the first \$2,000 in annual contributions to registered education savings plans (RESPs). The CESG makes it highly attractive for Canadians to use RESPs to save for the education of their children and grandchildren.

A separate
1999 budget
pamphlet
entitled
*Canadian
Opportunities
Strategy: Update*
outlines the
status of federal
investments
in these
seven areas

The Canada Education Savings Grant: A Success Story

- Most financial planners now agree that RESPs are the best way to save for a child's education.
- The number of institutions offering RESPs has risen from 30 to 80 since the CESG was announced. RESPs are now more accessible to all Canadians and are well on their way to becoming as essential to saving for education as RRSPs are to retirement planning.
- The number of families using RESPs has increased by one-third to almost 1 million.
- In the 25 years from their inception in 1972 through to the end of 1997, there was a \$2.5-billion net accumulation in RESPs. In 1998 alone, with the introduction of the CESG, the total soared to \$4.0 billion.

1999 Budget – Building on the Canadian Opportunities Strategy

The 1999 budget builds on the Canadian Opportunities Strategy by investing more than \$1.8 billion over the remainder of this fiscal year and the next three years in additional support for the creation, dissemination and commercialization of knowledge, and in support of employment.

The creation of knowledge

An additional \$200 million for the Canada Foundation for Innovation...

In 1997, the federal government established the Canada Foundation for Innovation (CFI) with a contribution of \$800 million. The CFI awards funding to universities and colleges, research hospitals and not-for-profit institutions. The 1999 budget commits an additional \$200 million to help the CFI meet the demand for research infrastructure in the areas of health, the environment, science and engineering.

The CFI makes investments in partnership with provincial governments, universities, and the private and voluntary sectors. Partnerships provide important leverage. Every \$40 contributed by the CFI can generate \$100 in total funding. Thus, the CFI has the potential to generate investments in research infrastructure amounting to \$2.5 billion – \$1.5 billion more than the \$1 billion contributed by the federal government to date.

... and increasing support for advanced research through funding to federal granting councils

In the 1998 budget, as part of the Canadian Opportunities Strategy, the federal government committed an additional \$405 million over three years to the three federal granting councils – the Natural Sciences and Engineering Research Council (NSERC), the Medical Research Council (MRC) and the Social Sciences and Humanities Research Council (SSHRC). These councils support advanced research, primarily through grants, fellowships and scholarships for graduate and post-graduate students. The funding announced in last year's budget restored the councils' budgets to their previous peak levels and helped them raise the value and number of research grants and scholarships.

The 1999 budget builds on last year's measures by providing increased funding over three years of \$75 million for NSERC and \$15 million for the SSHRC. This is in addition to funding that NSERC and the SSHRC are receiving under other measures in this budget that increase federal financial support for health research.

NSERC in Action

- Dr. Indira Samarasekera of the University of British Columbia develops mathematical models of industrial processes, particularly casting and rolling for steel and aluminum. In these processes, metal goes from liquid to solid, and the dramatic temperature change can result in cracks. Dr. Samarasekera's work has had a major impact on the design and operation of continuous casting moulds and quality of steel for products such as steel-belted radial tires and automobiles.
- Dr. Peter Allen of DalTech at Dalhousie University has developed a solar water heater that is now manufactured by Thermo Dynamics in Dartmouth, Nova Scotia. Since 1990, 1,500 water heaters have been sold in Europe, Africa and the Middle East.

SSHRC in Action

Dr. Louise Bouchard of the Université du Québec à Montréal examines the impact that new medical procedures and technologies have on patients once this new knowledge is transferred from the lab to the clinic. Dr. Bouchard's research has shed light on the need to link the introduction of new medical technologies with new support services and clinical options.

For more than 80 years, the National Research Council (NRC) has been the main science and technology agency of the federal government. Through its funding and research activities, the NRC spends about \$500 million annually. The 1999 budget provides \$16 million in 1998-99 to the NRC to invest in advanced equipment plus \$15 million over three years to better support national and regional research goals.

Investing
in the National
Research
Council

NRC Institutes in Action

- Pharmalaser Inc., a new company in Boucherville, Quebec, is using a laser spectrometer developed by the NRC's Industrial Materials Institute to test active ingredients in pharmaceutical tablets. This state-of-the-art tool is in its final testing stages. The company intends to market this laser spectrometer worldwide.
- CanAmera Foods Inc., a subsidiary of the Saskatchewan Wheat Pool, has been working with the NRC's Plant Biotechnology Institute in Saskatoon to develop a type of rapeseed with a super high erucic acid content. Erucic acid has applications in manufacturing, especially high-impact plastics and the photography industry. The current annual market for high erucic acid derived from oil from this crop exceeds \$100 million (U.S.) and is expected to at least double in size by the year 2010.
- Acadian Seaplants Ltd. of Dartmouth, Nova Scotia, develops and manufactures specialty products from Maritime Canada seaweeds. With the assistance of the NRC's Institute for Marine Biosciences in Halifax, the company is developing two unique products – a pink-coloured clone of the seaweed Irish moss for the edible seaweeds market in Asia and a biochemical extract from rockweed for high-yield agricultural crops worldwide.
- IMRIS Inc., a spinoff company from the NRC's Institute for Biodiagnostics in Winnipeg, is establishing an intraoperative Magnetic Resonance Imaging (MRI) manufacturing facility. This innovative new MRI technology, developed by the Institute in partnership with Magnex Scientific, Surrey Medical Imaging Systems, and F.A. Roberts and Associates Engineering, has been operational at the Calgary Foothills Medical Centre for over a year. It has been used successfully in more than 50 brain surgery operations.

Increasing
federal
support for
biotechnology
research and
development

Biotechnology is changing our understanding of the basic “building blocks” of life processes. This knowledge gives scientists new ways of improving the quality of human life – for example, through improved health care products and procedures, as well as through advances in agriculture and the food system. Canada is committed to being a world leader in biotechnology. This budget builds on current federal investments in biotechnology by adding \$55 million over three years for biotechnology research and development by science-based government departments and agencies.

Promoting Health Research and Innovation

As part of the federal government's effort to strengthen Canada's public health care system, the 1999 budget contains measures that promote health research and innovation. These initiatives are designed to enhance health care delivery, and promote the health and well-being of Canadians. Information about these measures may be found in *The Budget Plan* or in the booklet entitled *Strengthening Health Care for Canadians*.

The dissemination of knowledge

The federal government has been implementing a plan to make Canada the most connected country in the world – ensuring that all Canadians will be able to benefit from the knowledge and opportunities for learning that the information highway has created. To this end, the 1998 budget included \$205 million over three years to build on the success of the Community Access Program and SchoolNet, and to help the voluntary sector enhance its capacity through Voluntary Sector Network Support. An additional \$55 million was made available for the Canadian Network for the Advancement of Research, Industry and Education (CANARIE) to build the world's first national optical Internet – a next-generation Internet for research and development.

Connecting
Canadians

This budget will invest \$60 million over three years to establish one Smart Community Demonstration Project in each province, in the North and in an Aboriginal community. The purpose of this initiative is to pave the way for innovative uses of information technology – linking people and organizations together to share ideas and interests, and to promote community economic development. Communities will explore ways of developing electronic Internet-based information and services so that the benefits of this technology can be delivered to users in a more integrated and accessible fashion. The lessons learned in the course of these demonstration projects will advance the use of information technology at the community level across Canada.

Sharing ideas
through Smart
Communities

This budget also makes a commitment to fund the GeoConnections initiative at \$60 million over five years beginning in 1999-2000. The goal of this initiative is to develop and make available – through the information highway – comprehensive and integrated data about Canada's geography, environment, people and resources. Information will be categorized by geographical

Disseminating
information
through
GeoConnections

location to give users a detailed and timely profile of the physical, demographic and economic characteristics of any given region. In addition to keeping Canada at the forefront of mapping, GeoConnections will have applications in areas ranging from climate change monitoring to business development.

Transferring knowledge from the lab to market

The commercialization of knowledge

It is important that new ideas generated through research be transferred quickly from labs to firms that can use these ideas in commercial applications. It is the creation of new products that leads to jobs and economic growth.

The Networks of Centres of Excellence (NCE) program, renewed in the 1997 budget with a commitment of \$47 million in annual funding, supports partnerships among world-class researchers and the private sector across Canada. The 1999 budget will give the NCE program an additional \$90 million over three years starting in 1999-2000. This will fund up to eight new networks and enable the program to initiate a new competition in 1999 rather than waiting for its next planned competition in 2001.

NCE Spinoff Companies

- Micrologix Biotech Inc. is a public biopharmaceutical company developing innovative antibiotics to treat severe and life-threatening infectious diseases. Micrologix Biotech Inc. has 50 employees and is based in Vancouver. It was founded on technology developed within the Canadian Bacterial Disease Network (CBDN) and now includes a broad portfolio of drug candidates, including further technology developed within CBDN.
- Montreal-based Haptics Technologies makes computer peripherals and software technologies that simulate the sense of touch. The company's devices are used in the automotive and aerospace industries and have applications for the medical, virtual reality and design sectors. Haptics Technologies has 14 employees and is a spinoff company from the Institute for Robotic and Intelligent Systems.
- Micron Force Instruments is providing leading computer, telecommunications, automotive and consumer electronics companies with new methods for designing and testing tiny components. It has an office in Calgary and is a spinoff company from Micronet – Microelectronic Devices, Circuits and Systems.
- Ottawa-based ApoptoGen Inc. is exploring the clinical and commercial potential of the discovery of a family of genes that encode inhibitors of cell death. This research has practical applications in cancers and neurodegeneration. ApoptoGen Inc. is a spinoff company from the Canadian Genetic Diseases Network.

Technology Partnerships Canada (TPC) was created in 1996. TPC makes strategic investments with companies to commercialize innovative products and processes. It operates on the basis of partnership agreements between the government and the private sector in which both the risks and the benefits are shared, and the conditions for repayment of investments are specified. TPC invests in research, development and market development projects in the aerospace and defence industries, environmental technologies, and enabling technologies such as advanced manufacturing and advanced materials. This budget makes an additional \$150 million available to TPC over a three-year period starting in 1999-2000. This investment will foster new market opportunities and facilitate the creation and growth of high-technology industries.

Opening doors for high-tech industries through Technology Partnerships Canada

Small- and medium-sized enterprises (SMEs) continue to be the growth engine of the Canadian economy – accounting for approximately 50 per cent of all private-sector employment. SMEs need access to capital to innovate and improve their productivity performance. Parliament recently passed the new *Canada Small Business Financing Act*. This Act will provide guarantees to commercial lenders, who lend approximately \$2 billion to SMEs each year under this program.

The Business Development Bank of Canada (BDC) has also been given an important role in this area and has substantially increased its lending and investment efforts to help businesses in strategic sectors. In this budget, the government will inject an additional \$50 million in equity into the BDC through a purchase of dividend-paying preferred shares. This will allow the BDC to provide additional financing for knowledge-based and export-oriented businesses.

Canadian Space Agency

The Canadian Space Agency (CSA) plays a leading role in the development and application of space knowledge. It has been instrumental in the success of Canadian space technology firms in such fields as space robotics, earth observation, science and satellite communications. In the past, the CSA has been funded on a project-by-project basis. This situation has created uncertainty for the agency and its clients. In this budget, the government is providing the CSA with additional resources of \$430 million over three years and thereafter will stabilize funding at a level of \$300 million annually. These resources will support significant federal investments in space projects, science and technology.

Additional funding for the Youth Employment Strategy ...

... and the Canada Jobs Fund

Supporting employment

In recognition of the importance of work experience in building skills and knowledge among Canada's youth, the government has announced the renewal of the Youth Employment Strategy with funding of \$465 million over three years. This is a 50-per-cent increase in funding. For young Canadians, this measure will mean opportunities for summer employment, internships, and career and labour-market information services.

The government will provide \$110 million per year for a Canada Jobs Fund to create sustainable jobs in high-unemployment regions of Canada. The Minister of Human Resources Development will work closely with other levels of government, the private sector, regional development agencies and community organizations to stimulate employment in these regions.

Building on the Canadian Opportunities Strategy

	1998-99	1999-00	2000-01	2001-02	Total
(millions of dollars)					
Creating knowledge					
Canada Foundation for Innovation ¹	100				100
SSHRC		5	5	5	15
NSERC		25	25	25	75
National Research Council	16	5	5	5	31
Biotechnology		15	20	20	55
Disseminating knowledge					
Smart Communities		15	30	15	60
GeoConnections		12	12	12	36
Commercializing knowledge					
Networks of Centres of Excellence		30	30	30	90
Technology Partnerships Canada		50	50	50	150
Business Development Bank of Canada ²	50				50
Canadian Space Agency		41	152	237	430
Supporting employment					
Youth Employment Strategy		155	155	155	465
Canada Jobs Fund		110	110	110	330
Total	166	463	594	664	1,887

¹ Funding for the Canada Foundation for Innovation will be increased by \$200 million. Based on awards in 1998, it is expected that about half of this amount will support research infrastructure in the environment, sciences and engineering.

² Federal support for the Business Development Bank of Canada is in the form of an equity injection – i.e. the purchase of shares. As such, it is not counted as a budgetary expenditure.

Conclusion

The 1999 budget adds more than \$1.8 billion over the remainder of this fiscal year and the next three years to promote the creation, dissemination and commercialization of knowledge, and to support employment. These investments build on the Canadian Opportunities Strategy, and represent a balanced and comprehensive approach to advancing Canada's knowledge and innovation agenda.

These investments will help turn ideas into value-added, job-creating industries of the future, and are consistent with the government's commitment to spur Canada's productivity growth by helping businesses, organizations and individuals put new ideas to work. For Canadians, continued productivity growth will mean a better standard of living and a better quality of life.

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